On the biology of the Olivaceous Leaf Warbler of the Tian-Shan Mountain[1]

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(*With three plates*)

The Olivaceous Leaf Warbler (*Phylloscopus griseolus* Blyth) is a typical representative of the avian fauna of the mountainous regions of Middle and Central Asia and partly in south-western Siberia, from Upper India on the south to the sources of the Ob on the north. It inhabits the Western Himalayas, the northern border of the Tibet upland and the Kuen-Lun Mts approximately up to 91°E., the mountain ranges in Afghanistan to the north of Ziarat (in Baluchistan), the Hindukush, Western Kashgaria, Pamir, Kuhitang and Tian-Shan Mts, the Dzungarskiy Alatau and Tarbagatai ridges, the central and north-western parts of Altai, the Khangai Altai and Gobi Altai approximately up to the 85°E. It nests sporadically in the eastern part of the Kazakh plateau. The Olivaceous Leaf Warbler winters in Pakistan and India as far as Hyderabad in the south.

The biology of this species is still very little known. The data on the way of life of this warbler in diverse ranges of the Tian-Shan mountainous country available in the literature (Zarudniy & Koreev 1906 ; Shnitnikov 1949 ; Korelov 1956a, 1956b ; Stepanian 1959 ; Yanushevich *et al.* 1960) are rather scanty and fragmentary. The main materials for this paper were collected in the Bolshoye Almatinskoye canyon of the Zailiyskiy Alatau range (in the northern Tian-Shan, near Alma-Ata) in 1964-5 by I. A. Dolgushin, E. I. Gavrilov, E. F. Rodionov and M. A. Kuzmina, in 1967 and 1969 by E. F. Rodionov, and 1971-2 by A. F. Kovshar. The observations of A. F. Kovshar in the Talasskiy Alatau ridge (in the western Tian-Shan) in 1960-66 and the data from literature on other ridges of the Tian-Shan were also used.

Unlike other representatives of the genus *Phylloscopus*, the Olivaceous Leaf Warbler is not a forest bird and during the nest period avoids forests and soft grassy slopes, preferring rocky slopes with thinly growing

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shrubs. In the Tian-Shan it usually nests above the upper limit of fir-groves but it can descend to the forested zone along stone screes : in the Zailiyskiy Alatau ridge at least up to 2300 m, and in the Terskei Alatau ridge up to 1900 m (Kovshar 1972a). In the Terskei Alatau the vertical distribution of this warbler is rather peculiar. In the eastern portion of the ridge it inhabits the Alpine and Subalpine zones up to 3700-3800 m, is absent in the forest zone and reappears on the slopes of the foothills facing the Issykkul Lake depression ; in its western part, where the tree zone is not continuous, the Olivaceous Leaf Warbler probably nests everywhere from the foothills up to the Alpine grasslands (Stepanian 1959).

The favourite places of nesting of the Olivaceous Leaf Warbler in the Bolshoye Almatinskoye canyon are the stony taluses and deposits with large boulders and some patches of creeping juniper (*Juniperus turcestanica*) or stunted little bushes of *Lonicera* sp., *Spiraea*, *Atraphaxis*, *Cotoneaster*. Under such conditions it also nests on the edges of spruce-groves, but does not enter the depths of the forest. Only once, in June 1971, a couple of birds made an unsuccessful attempt to build their nest on a fir-tree in a relatively thick forest (2315 m).

The numbers of the Olivaceous Leaf Warblers in the Tian-Shan are low. It is rare in the Terskei Alatau ridge (Stepanian 1959), not numerous in the Talasskiy Alatau (Kovshar 1966) and on the northern slopes of the Kungei Alatau, but rather frequent in the Zailiyskiy Alatau.

In spring the warblers appear in their nesting places by the last ten days of April. In the Bolshoye Almatinskoye canyon in 1965 the first was seen on 29 April, and in 1972 on 23 April. In the neighbouring Kaskelen canyon the arrival was registered on 28 April 1954. To the southern slopes of the Talasskiy Alatau in 1954 the warblers arrived on 21 April, to the western part of the range in 1958 on 27 April, to the northern slopes in 1966 on 27 April and in 1965 on 28 April. In the Issykkul Lake area and to the south of it they appear a little earlier. For example, in Naryn (Central Tian-Shan) in 1909 they arrived on 15 April, on the southern slopes of the Kungei Alatau ridge a male was taken on 15 April 1952 and in the Terskei Alatau on 26 April 1956 (Yanushevich *et al.* 1960). A very early arrival was registered in the Terskei Alatau ridge in 1961 : two males were observed there on 25 and 26 March, but after that they evidently did not appear till 12 April (Shukurov 1968).

In the beginning the warblers are rather secretive and only their characteristic call, strikingly resembling the sound of water drops dripping on to a wet stone, betrays them. But in a few days the males begin singing : in 1972 the first song was heard on 28 April and in 1965 on 3 May, i.e. 5 and 4 days after the arrival. The song consists of 3-9, usually 4-5 notes of the same pitch closely following one after another. They can be represented as *tivtivtivtivtiv, twitwitwitwitwi, kwikwikwikwikwi,*

Fig. 1. The surroundings of the Bolshoye Almatinskoye lake.

Figs. 2 & 3. Nesting places of the Olivaceous Leaf Warbler.

wiwiwiwiwi or *ktitititititi*, all in the same key. Sometimes the song is preceded by a call resembling the smacking of lips. The birds sing more frequently perched on stones, but sometimes they sing in bushes and even in the crowns of fir-trees.

In the beginning the birds sing very rarely, usually single songs with great pauses between them. In early May sometimes 30-40 calls may be heard in succession and in the middle of the month it is possible to count 50 calls in 15 minutes, emitted by one bird. The peak of the vocal activity falls in late May—before the beginning of nidification. On 24 May 1971 at 8.00 a.m. a male sang 102 songs in 15 minutes. During this period the males sing not only when moving or collecting food, but also sitting in one place. At the moment of highest excitement (when the female is by him) the male's wings often quiver and the tail is raised upward almost like a wren's.

During the building of the nest the males sing intermittently, emitting several songs at a time and accompanying the female who is flying in search of materials. They also sing briefly but often in the breeding period, when they come flying to the nest and especially before flying off for a new portion of insects. After the young begin to fly the singing of the Olivaceous Leaf Warbler not only does not stop, but even increases. For example, on 18 July 1971 a male feeding nestlings that had begun to fly sang 144 times from 8.00 to 9.00 a.m., and 109 times during the next hour. Throughout the second half of July, when the Olivaceous Leaf Warblers fed their fledgelings, their singing can be often heard at any hour of the day, from 5.50 a.m. till 19.40 p.m. In August they sing more rarely but regularly till the end of the month.

The last song in the Bolshoye Almatinskoye canyon was heard on the 7th of September, 1972.

The birds nest in separate pairs settling at a considerable distance from one another, which in the Bolshoye Almatinskoye canyon averages 150 m. Their attitude to other species is indifferent; one Olivaceous Leaf Warbler's nest was found at a distance of only 10 m from the nest of a Yellowbrowed Warbler.

The pairs form apparently not later than the first half of May, as till this time only single birds are seen, in most cases singing males. The earliest sighting of a pair was on 16 May, 1965. However, the singing males obstinately prefer some places, the future nesting territories, even before pair formation. The birds while nesting show a preference for well warmed southern and eastern slopes. In the Bolshoye Almatinskoye canyon 13 nests (86·6%) out of 15 were on the eastern, south-eastern and southern slopes and only 2 (13·4%) on the northern ones. In the Terskei Alatau ridge 8 cases of nesting on the slopes facing the southern compass points have been observed and not a single one on the northern (Kovshar 1966).

After the middle of May the Olivaceous Leaf Warblers begin to build their nests which they arrange in the bushes or on grass stems not very high above the ground. In most cases nests are built on the low bushes of creeping juniper. Eleven nests from 23 found in the Bolshoye Almatinskoye canyon were built on juniper, the rest were found as follows : 6 on low stunted leaf-bearing shrubs with not dense foliage (honeysuckle 3, sweetbriar 2, rowan tree 1) and 5 on grass stems, mostly cereals growing near stones or under the crowns of bushes. The height of the nests above the ground may be 5-50, usually only 5-15 cm (50% of the nests), and one nest was situated so that it almost touched the earth. Only once the birds made an attempt to build their nest on the lower branches of a 25 m fir-tree at a height of 2 m from the ground but they abandoned it half-made.

In the Terskei Alatau ridge a nest was found in a bush of creeping juniper (Stepanian 1959), and in the Talasskiy Alatau, besides creeping juniper, meadowsweet, wormwood (2 nests) and astragalus, two nests were constructed on the lower branches of 15 m-old juniper trees (*Juniperus zeravshanica*) at a distance of 40 cm from the ground.

The nest is a closed elliptical construction with the entrance on one side. It is woven from dry grass stems and narrow strips of bast and the inside covered with down and feathers. When the nest is made so warm it may seem that the orientation of the entrance does not play an important rôle, but according to data collected in the Zailiyskiy Alatau ridge the Olivaceous Leaf Warblers prefer the southern and eastern cardinal points. Thus, out of 19 nests the entrances of 6 were directed to the east, 4 to the south, 2 each to the south-east, south-west, west and north-east, and one to the north-west. The sizes of 7 nests from the Zailiyskiy Alatau were : length (along the axial line passing through the entrance) 90-170 (aver. 139) mm, width 115-190 (aver. 118) mm, height 85-150 (aver. 126) mm, the diameter of the chute 50-70 mm, its depth 20-45 mm. The height of the chamber of one nest was 73 mm. The entrance has the form of a horizontal oval, its width equals 40-46 (aver. 43) mm, its height 28-40 (aver. 34) mm. About the same sizes are reported for nests from central and western Tian-Shan (Stepanian 1959 ; Kovshar 1966).

The nest is built by the female,[1] and the male in the meanwhile remains nearby, sings, sometimes accompanies the female and in one case obviously tried to take away from her the building material which she was carrying to the nest. The female carries bast from bushes growing at a distance of 20 to 60 m, flying repeatedly to the same selected shrub (mostly honeysuckle). Jumping from one branch to another, she pulls off with force narrow strips of bast, fluttering with her wings, setting

[1] Indications that the male participates in the nest-building (Abdusaliamov 1964) are not confirmed by our observations, made over many years.

her feet against the branch and sometimes even trying to take flight without having completely torn off the strip. After having gathered in her beak some ten strips, she flies swiftly and without stopping towards the nest, but does not enter it at once ; instead she sits on some branch not far distant and looks around, emitting a low 'smacking' sound. Depositing the material in the nest takes only half a minute. A little more time is spent in the gathering of bast and grass, but sometimes the female returns to the nest with the material in one or two minutes. To one of the nests the female during an hour, from 11.25 hrs. to 12.25 hrs., brought bast of honeysuckle 9 times; to another in the period of one hour and a half (from 10.30 till 12 noon) 17 times. The bird brings down and feathers much more seldom, as it has to fly 200-300 m in search of them. Thus, during 7 hours of observation (from 6 to 13 hours), the female arrived at the nest only thrice, at 9, 12 and 13 hours. Building is carried on chiefly in the first half of the day, especially in the forenoon (in 7 nests it was observed between 10.00 and 12.00 and only in one at 7.30), rarely in the evening : females with material in their bills were seen only 3 times, at 16.00, 19.00 and 20.00.

The building of the nest takes 4-10 days and sometimes more. As a rule if the construction was begun earlier it takes more time than with the late ones. Thus, one nest was one-third built on 22 May and finished only on 31 May ; another one on 22 May had already an elliptical form, but was finished only on 29 May. Yet a nest begun on 29 May was finished by 5 June, and another begun on 19 June finished on 23 June.

The female begins laying eggs 2-6 days after finishing the nest, on the average (8 birds counted) 4½ days after. The shortest interval is when the nest has been built very late. Eggs are laid every day in the morning. In a full clutch there can be 4-6, as a rule 5 eggs. In the Zailiyskiy Alatau ridge in four nests were 4 eggs, in thirteen 5 and in one 6 eggs. In two nests only 2 and 3 eggs were found, but these layings were seemingly not completed. In the Terskei Alatau a nest was found with 5 nestlings (Stepanian 1959) and in the Talasskiy Alatau in three nests there were 5 and in one 6 eggs (Kovshar 1966). The incubation begins after laying the last egg and lasts 14-17 days ; in the 5 cases known to us the young were hatched 14, 15, 15, 15 and 17 days after the laying of the last egg.

The young hatch in a period of 24 hours and in size have almost no difference at all. The sparse greyish down grows in bundles over the supraocular, occipital and humeral parts of the body. The skin is yellow. The ends of the mouth are whitish, its inner surface is yellow and the tongue without spots. The eyes and the acoustic duct are closed.

The young are fed by both parents. The first days the female warms them for most of the time and the food is carried by the male, but when

they are already a week old the young receive food more or less equally from both parents. Thus, in one nest with 5 two-day-old nestlings, the male brought food 64 times during the day (from 5.05 till 20.10). The female who sat warming the young left the nest 19 times during the day each time being absent for 2-11, mostly for 5-8, minutes (only once, at noon, she was absent for 25 minutes), but she only brought food 7 times and the remaining 12 flights she apparently used in order to feed herself. Six days later the parents brought to this nest 120 portions of food, of which 58 were brought by the male and 62 by the female, the latter leaving the nest each time after the feeding. In another nest four 8-day-old young were brought 174 portions of food ; it was carried by both parents, but the female sat 4 times on the nest for 15, 8, 12 and 6 minutes, mainly during rain. Five days later the warblers brought to these young 175 portions of food (86 by the male and 89 by the female). It seems that the intensity of feeding noticeably increases only during the first week of life of the young and in the following 7 days it remains constant.

Each portion of food consists, as a rule, of several insects, sometimes of a big caterpillar or butterfly. Accordingly it is distributed between the young or given to one of them. In one of the nests the male more often fed one of the young, rarely two of them, but the female usually divided the food between two or three of them, the bulk of the portion of food being given to one of the nestlings. The flights for food usually are not far, a distance of 70-80 m, but sometimes the warblers may fly away for 100-150 m.-Insects are usually gathered and caught on the surface of stones and in the cracks between them, often in the grass and branches of low leaf-bearing shrubs. They collect food much more rarely in the crowns of spruce-trees, picking the insects and their larvae among the needles ; in one case we observed the male who, fluttering his wings and hanging in the air for several seconds in front of a fir branch, swiftly and deftly picked something from among the needles ; this method was used by him several times. The ability of the Olivaceous Leaf Warblers to move with certainty on vertical planes allows them to seek for food even in an unusual environment. We had the opportunity of observing how a warbler during half an hour fed on wooden electro-transmission poles, searching one pole after another for food. Sitting at the foot of the pole, the bird quickly examined the cracks in the wood and the fissures between the wood and the iron rail container, then it began to move up the pole, taking from the cracks the insects hidden there, mainly flies. During the ascent she turned freely in all directions, even head down, but moved only upwards.

The young are fed chiefly insects, rarely spiders. In 21 samples of food, taken in two nests with the help of ligatures round the neck (Malchevsky & Kadochnikov 1953), there were 10 butterflies, 7 cater-

pillars, 6 flies, 2 collembola, 1 grasshopper and 5 spiders. Visual observation near the nests gave 102 (37%) cases of butterflies and 132 (48%) of caterpillars. The remaining 15% consisted of flies (23 cases), mosquitoes (7), bot-flies (1), collembola, grasshoppers (2) and spiders (7). There is practically no difference between the food carried by the male and the female. Both parents equally share the task of keeping the nest clean and take away the faecal capsules with regularity.

The young grow rather quickly and when 11 days' old are already so active that they can easily leave the nest if frightened. Sometimes this may happen without any obvious cause. Thus, in one nest on the twelfth day two young scrambled out of the nest and hid beneath it. When we put them on their former place they remained there, but two days later without obvious reasons they again one after another (at 9.41 and 10.19) left the nest and sat on a stone within 2 m of it. Only after 6 hours of hunger (their parents fed only those sitting in the nest) both young one after another independently returned to the nest. Normally the flights of the young take place in the morning (in one nest at 9.00, in another at 10.00), 15-17 days after they hatched. In three instances the young left the nest after 15 days, in one after 16 and in one after 17.[1]

The young that have left the nest hide not far from it in the shadow of bushes or overhanging stones and keep very still—at feeding time they can be located by the song of the male or the low call of the female. After a week the young fly rather well but keep close to the nest; we met two of them on the 7th day at a distance of only 3 and 10 m. They apparently return to the surroundings of the nest periodically. Thus, on the above-cited day, the male took two young away with him to 50-70 m. In both cases he behaved identically: having flown without food to the bush under which the young was hidden he began to sing and when the latter climbed into the bush asking for food, he suddenly flew away for 10 m, then again and again, thus leading the young bird in the desired direction. Next morning, the young were again hidden near the nest. This bird kept in the neighbourhood of the nest for 15 days, from the 12th till the 27th of July, and all this time the male went on singing and feeding the young that could already fly.

The calendar period of breeding of the Olivaceous Leaf Warbler is everywhere rather compressed, as can be seen in the Table.

In the Zailiyskiy Alatau ridge at the altitude of 2370-2700 m the Olivaceous Leaf Warblers begin to lay eggs chiefly during the first 20 days of June. The earliest layings here were begun on 4 June, 1964, and on 4 June, 1971, the latest on 28 June, 1969. It should be noted that late layings were observed only in the years 1960 and 1969, characterized by

[1] In this nest the hatching also took 17 days, i.e. more than in the other cases.